

## GMOs AND THE ENVIRONMENT

### GENETIC ENGINEERING and the environment

Genetic engineering involves adjusting genes to get the traits we want. Since DNA is the same among all living things, we can work with a plant's existing "gene library," (**cisgenics**) or get genes from another organism (**transgenics**).

Genetically engineered crops allow farmers to produce more food while lessening impact on the environment.

### MORE OF THE SAME, BUT DIFFERENT

The first genetically engineered crops focused on benefits to the farmer – better weed and insect pest control, reducing the need for tillage and multiple spray applications. As with all new crop varieties, developers of GE crops need to prove to regulatory agencies that their crops produce food that is as safe and have the same qualities as products already on the shelf.

### Smaller ENVIRONMENTAL FOOTPRINTS

Weeds can be a major problem for farmers because they compete with the crops for water, nutrients and space. Herbicide-resistant crops are engineered to withstand a "broad spectrum" herbicide, that is, effective against many different kinds of weeds. These crops can be sprayed by that herbicide without harm and all the weeds will die – an efficient strategy that reduces costs. Before GE varieties were available, farmers sometimes couldn't grow these crops because there was no effective way to control weeds.



More recently, researchers have developed GE crops with consumer-oriented benefits.



Cotton Field



**Insect-resistant crops are genetically engineered so pests die if they try to eat them. This means farmers don't need to spray as often, or they may not need to spray at all.**



## HOW'D YOU GET SO POPULAR?

Genetically engineered crops are considered the fastest-adopted crop technology in the history of agriculture. Regulators in Brazil and Argentina could not keep up with demand for GE soybean, while Bangladesh and India had similar challenges with eggplant (brinjal).

**In North America, more than 90 per cent of Canadian canola is now genetically engineered as is about 90 per cent of the American corn and sugar beet crops.**



Insect Damaged Canola



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### INVASION OF THE SUPER WEEDS

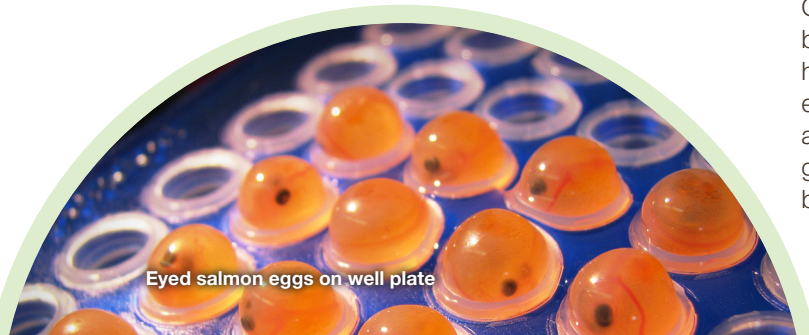
Weeds can become resistant to the herbicides used with GE crops. But these so-called “super weeds” aren’t very super. Farmers can control this problem by rotating crops and using different varieties of crops. Weeds that have become resistant to one herbicide can be controlled with another.



### AQUAMAN’S SCHOOL OF LIFESTOCK

Wild fish stocks around the world are under pressure of collapse due to humanity’s insatiable appetite. Using genetic engineering, researchers from the Memorial University of Newfoundland modified Atlantic salmon, one of the world’s most commonly farmed fish.

Using a technique called microinjection – literally, injecting DNA into cells with a tiny needle – they inserted growth hormone genes from Chinook salmon and another fish called an ocean pout. This produced the AquAdvantage salmon that reaches market weight in half the time – about 18 months – than its non-engineered cousins. It uses less feed and can be produced in tanks on land, meaning production can be closer to markets.



Eyed salmon eggs on well plate



Field of milkweed



Farmer in canola field

### Safer fields

Since the farmer doesn’t need to spray the crop to control insect pests, non-target insects such as bees and butterflies are unharmed. Insecticides are poisonous, so they must be handled carefully. By eliminating the need to spray, GE insect-resistant crops make things safer for farmers and farm workers.

### WHAT ABOUT THE BUTTERFLIES?

Monarch butterflies migrate over several years from Mexico across the US and into Canada before turning south again. Their caterpillars eat milkweed, a poisonous plant (which makes them toxic too). Birds have learned the butterflies’ colours are a warning: **“Don’t eat me!”**

While milkweed is food for monarch caterpillars it’s a hazard for grazing livestock and a problem weed. Farmers spray herbicide to get rid of it (as well as other weeds) since it competes with their crops.

Genetically engineered crops such as corn and soybean have been blamed for the decline of monarch butterflies, since the herbicides used with some of these crops are very good at eradicating milkweed. However, there are other pressures such as parasites, habitat loss from logging in monarchs’ wintering grounds in Mexico and more frequent harsh weather brought on by climate change.

